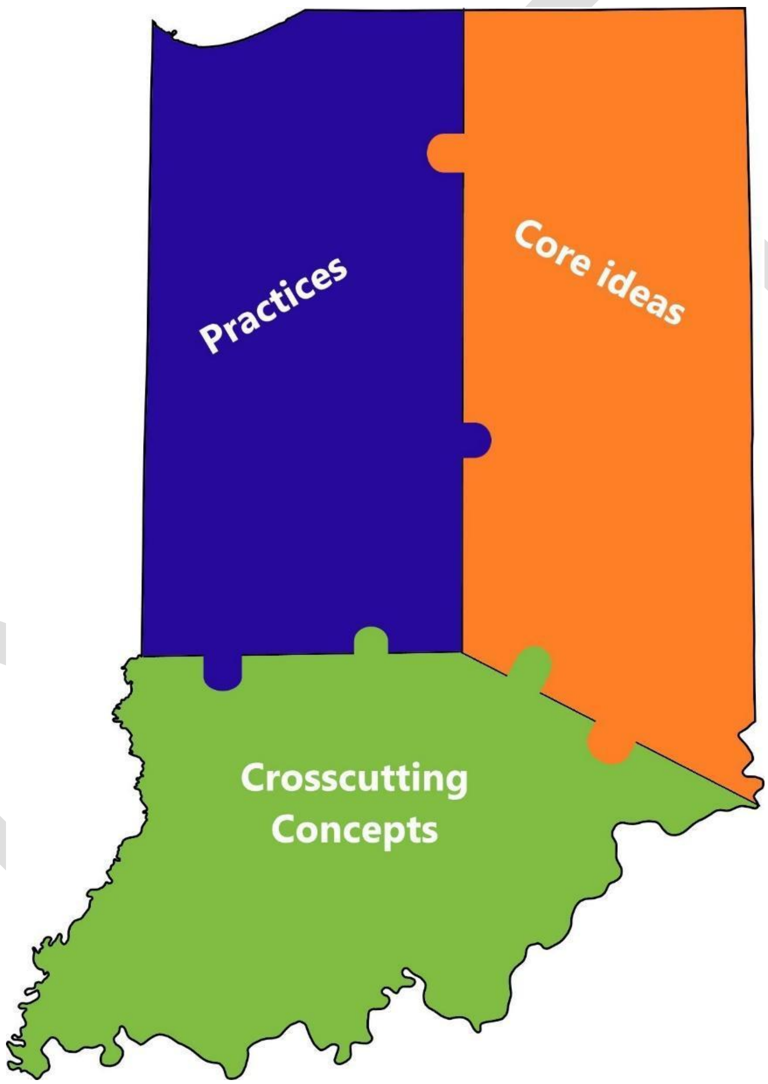
Indiana Academic Standards

Science



Grade 2

K-12 Science Indiana Academic Standards Overview

The K-12 Science Indiana Academic Standards are based on *A Framework for K-12 Science Education* (NRC 2012) and are meant to reflect a new vision for science education. The following conceptual shifts reflect what is new about these science standards. The K-12 Science Indiana Academic Standards

- reflect science as it is practiced and experienced in the real world,
- build logically from Kindergarten through Grade 12,
- focus on deeper understanding as well as application of content,
- integrate practices, crosscutting concepts, and core ideas.

The K-12 Science Indiana Academic Standards outline the knowledge and science and engineering practices that all students should learn by the end of high school. The standards are three-dimensional because each student performance expectation engages students at the nexus of the following three dimensions:

- Dimension 1 describes scientific and engineering practices.
- Dimension 2 describes crosscutting concepts, overarching science concepts that apply across science disciplines.
- Dimension 3 describes core ideas in the science disciplines.

Science and Engineering Practices

The eight practices describe what scientists use to investigate and build models and theories of the world around them or that engineers use as they build and design systems. The practices are essential for all students to learn and are as follows:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Crosscutting Concepts

The seven crosscutting concepts bridge disciplinary boundaries and unit core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas, and develop a coherent, and scientifically based view of the world. The seven crosscutting concepts are as follows:

1. *Patterns*- Observed patterns of forms and events guide organization and classification, and prompt questions about relationships and the factors that influence them.
2. *Cause and effect- Mechanism and explanation*. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

3. *Scale, proportion, and quantity*- In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.
4. *Systems and system models*- Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
5. *Energy and matter: Flows, cycles, and conservation*- Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.
6. *Structure and function*- The way in which an object or living thing is shaped and its substructure determines many of its properties and functions.
7. *Stability and change*- For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

Disciplinary Core Ideas

The disciplinary core ideas describe the content that occurs at each grade or course. The K-12 Science Indiana Academic Standards focus on a limited number of core ideas in science and engineering both within and across the disciplines and are built on the notion of learning as a developmental progression. The Disciplinary Core Ideas are grouped into the following domains:

- Physical Science (PS)
- Life Science (LS)
- Earth and Space Science (ESS)
- Engineering, Technology and Applications of Science (ETS)

The K-12 Science Indiana Academic Standards are not intended to be used as curriculum. Instead, the standards are the minimum that students should know and be able to do. Therefore, teachers should continue to differentiate for the needs of their students by adding depth and additional rigor.

Why use the Framework for K12 Science Education as the basis for the revision of science Indiana Academic Standards?

- The framework and standards are based on a rich and growing body of research on teaching and learning in science, as well as on nearly two decades of efforts to define foundational knowledge and skills for K-12 science and engineering.
- Studies show that even young children are naturally inquisitive and much more capable of abstract reasoning than previously thought. This means we can introduce elements of inquiry and explanation much earlier in the curriculum to help them develop deeper understanding.
- The new standards aim to eliminate the practice of "teaching to the test." Instead, they shift the focus from merely memorizing scientific facts to actually doing science—so students spend more time posing questions and discovering the answers for themselves.
- Historically, K-12 instruction has encouraged students to master lots of facts that fall under "science" categories, but research shows that engaging in the practices used by scientists and engineers plays a critical role in comprehension. Teaching science as a process of inquiry and explanation helps students think past the subject matter and form a deeper understanding of how science applies broadly to everyday life. This is in alignment with the Indiana Priorities for STEM education.
- These new standards support the research by emphasizing a smaller number of core ideas that students can build on from grade to grade. The more manageable scope allows teachers to weave in practices and concepts common to all scientific disciplines — which better reflects the way students learn.
- It is important that each standard be presented in the 3-dimensional format to reflect its scope and full intent.
- Given that each standard is a performance expectation (what students should know and be able to do), the standards are presented with some accompanying supports including clarification and evidence statements.

How to read the revised Science Indiana Academic Standards

Standard Number	**Title**	The title for a set of performance expectations is not necessarily unique and may be reused at several different grade levels

Students who demonstrate understanding can:

Standard Number **Performance Expectation: A statement that combines practices, core ideas, and crosscutting concepts together to describe how students can show what they have learned** [Clarification Statement: A statement that supplies examples or additional clarification to the performance expectation.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Activities that scientists and engineers engage in to either understand the world or solve the problem. There are 8 practices. These are integrated into each standard. They were previously found at the beginning of each grade level content standard and known as SEPs. **Connections to the Nature of Science** Connections are listed in either practices or the crosscutting concepts section.	Concepts in science and engineering that have broad importance within and across disciplines as well as relevance in people's lives To be considered core, the ideas should meet at least two of the following criteria and ideally all four: • Have broad importance across multiple sciences or engineering disciplines or be a key organizing concept of a single discipline; • Provide a key tool for understanding or investigating more complex ideas and solving problems; • Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge; • Be teachable and learnable over multiple grades at increasing levels of depth and sophistication. Disciplinary ideas are grouped in four domains: the physical sciences; the life sciences; the earth and space sciences; and engineering, technology and applications of science.	Seven ideas such as Patterns and Cause and Effect, which are not specific to any one discipline but cut across them all. Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. **Connections to Engineering, Technology and Applications of Science** These connections are drawn from either the Disciplinary Core Ideas and Science and Engineering Practices.

Evidence Statements	
1	Evidence Statements provide educators with additional detail on what students should know and be able to do.
2	The evidence statements can be used to inform the scaffolding of instruction and the development of assessments.

2-PS1-1 Matter and Its Interactions

Students who demonstrate understanding can:

2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary. Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ● Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.	**PS1.A: Structure and Properties of Matter** ● Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.	**Patterns** ● Patterns in the natural and human designed world can be observed.

Observable features of the student performance by the end of the grade:		
1	Identifying the phenomenon under investigation	
	a	Students identify and describe* the phenomenon under investigation, which includes the following idea: different kinds of matter have different properties, and sometimes the same kind of matter has different properties depending on temperature.
	b	Students identify and describe* the purpose of the investigation, which includes answering a question about the phenomenon under investigation by describing* and classifying different kinds of materials by their observable properties.
2	Identifying the evidence to address the purpose of the investigation	
	a	Students collaboratively develop an investigation plan and describe* the evidence that will be collected, including the properties of matter (e.g., color, texture, hardness, flexibility, whether is it a solid or a liquid) of the materials that would allow for classification, and the temperature at which those properties are observed.
	b	Students individually describe* that:
		i. The observations of the materials provide evidence about the properties of different kinds of materials.
		ii. Observable patterns in the properties of materials provide evidence to classify the different kinds of materials.
3	Planning the investigation	

	a	In the collaboratively developed investigation plan, students include:
		i. Which materials will be described* and classified (e.g., different kinds of metals, rocks, wood, soil, powders).
		ii. Which materials will be observed at different temperatures, and how those temperatures will be determined (e.g., using ice to cool and a lamp to warm) and measured (e.g., qualitatively or quantitatively).
		iii. How the properties of the materials will be determined.
		iv. How the materials will be classified (i.e., sorted) by the pattern of the properties.
	b	Students individually describe* how the properties of materials, and the method for classifying them, are relevant to answering the question.
4	Collecting the data	
	a	According to the developed investigation plan, students collaboratively collect and record data on the properties of the materials.

2-PS1-2 Matter and Its Interactions

Students who demonstrate understanding can:

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists and engineers use a range of tools to identify the significant features in the data. They identify sources of error in the investigations and calculate the degree of certainty in the results. Advances in science and engineering makes analysis of proposed solutions more efficient and effective. They analyze their results by continually asking themselves questions; possible questions may be, but are not limited to: "Does this make sense?" "Could my results be duplicated?" and/or "Does the design solve the problem with the given constraints?" SEPS.5 Using mathematics and computational thinking Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ● Analyze data from tests of an object or tool to determine if it works as intended.	**PS1.A: Structure and Properties of Matter** ● Different properties are suited to different purposes.	**Cause and Effect** ● Simple tests can be designed to gather evidence to support or refute student ideas about causes. - ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science, on Society and the Natural World** ● Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

Observable features of the student performance by the end of the grade:		
1	Organizing data	
	a	Using graphical displays (e.g., pictures, charts, grade-appropriate graphs), students use the given data from tests of different materials to organize those materials by their properties (e.g., strength, flexibility, hardness, texture, ability to absorb).
2	Identifying relationships	
	a	Students describe* relationships between materials and their properties (e.g., metal is strong, paper is absorbent, rocks are hard, sandpaper is rough).
	b	Students identify and describe* relationships between properties of materials and some potential uses purpose (e.g., hardness is good for breaking objects or supporting objects; roughness is good for keeping objects in place; flexibility is good to keep a materials from breaking, but not good for keeping materials rigidly in place).
3	Interpreting data	
	a	Students describe* which properties allow a material to be well suited for a given intended use (e.g., ability to absorb for cleaning up spills, strength for building material, hardness for breaking a nut).
	b	Students use their organized data to support or refute their ideas about which properties of materials allow the object or tool to be best suited for the given intended purpose relative to the other given objects/tools (e.g., students could support the idea that hardness allows a wooden

		shelf to be better suited for supporting materials placed on it than a sponge would be, based on the patterns relating property to a purpose; students could refute an idea that a thin piece of glass is better suited to be a shelf than a wooden plank would be because it is harder than the wood by using data from tests of hardness and strength to give evidence that the glass is less strong than the wood) .
	c	Students describe* how the given data from the test provided evidence of the suitability of different materials for the intended purpose.

2-PS1-3 Matter and Its Interactions

Students who demonstrate understanding can:

2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it, and are consistent with the available evidence.

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Different properties are suited to different purposes.
- A great variety of objects can be built up from a small set of pieces.

Crosscutting Concepts

Energy and Matter

- Objects may break into smaller pieces and be put together into larger pieces, or change shapes.

Observable features of the student performance by the end of the grade:		
1	Articulating the explanation of phenomena	
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that an object made of a small set of pieces can be disassembled and made into a new object.
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.
2	Evidence	
	a	Students describe* evidence from observations (firsthand or from media), including:
		i. The characteristics (e.g., size, shape, arrangement of parts) of the original object.
		ii. That the original object was disassembled into pieces.
		iii. That the pieces were reassembled into a new object or objects.
		iv. The characteristics (e.g., size, shape, arrangement of parts) of the new object or objects
3	Reasoning	
	a	Students use reasoning to connect the evidence to support an explanation. Students describe* a chain of reasoning that includes:
		i. The original object was disassembled into its pieces and is reassembled into a new object or objects.

		ii.	Many different objects can be built from the same set of pieces.
		iii.	Compared to the original object, the new object or objects can have different characteristics, even though they were made of the same set of pieces.

2-PS1-4 Matter and Its Interactions

Students who demonstrate understanding can:

2-PS1-4. **Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.** [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

Science and Engineering Practices

Engaging in Argument from Evidence

Scientists and engineers use reasoning and argument based on evidence to identify the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation, the process by which evidence-based conclusions and solutions are reached, to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims.

Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Construct an argument with evidence to support a claim.

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Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Science searches for cause and effect relationships to explain natural events.

Disciplinary Core Ideas

PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns.

Observable features of the student performance by the end of the grade:		
1	Supported claims	
	a	Students make a claim to be supported about a phenomenon. In their claim, students include the idea that some changes caused by heating or cooling can be reversed and some cannot.
2	Identifying scientific evidence	
	a	Students describe* the given evidence, including:
		i. The characteristics of the material before heating or cooling.
		ii. The characteristics of the material after heating or cooling.
		iii. The characteristics of the material when the heating or cooling is reversed.
3	Evaluating and critiquing the evidence	
	a	Students evaluate the evidence to determine:
		i. The change in the material after heating (e.g., ice becomes water, an egg becomes solid, solid chocolate becomes liquid).

		ii. Whether the change in the material after heating is reversible (e.g., water becomes ice again, a cooked egg remains a solid, liquid chocolate becomes solid but can be a different shape).
		iii. The change in the material after cooling (e.g., when frozen, water becomes ice, a plant leaf dies).
		iv. Whether the change in the material after cooling is reversible (e.g., ice becomes water again, a plant leaf does not return to normal).
	b	Students describe* whether the given evidence supports the claim and whether additional evidence is needed.
4	Reasoning and synthesis	
	a	Students use reasoning to connect the evidence to the claim. Students describe* the following chain of reasoning:
		i. Some changes caused by heating or cooling can be reversed by cooling or heating (e.g., ice that is heated can melt into water, but the water can be cooled and can freeze back into ice [and vice versa]).
		ii. Some changes caused by heating or cooling cannot be reversed by cooling or heating (e.g., a raw egg that is cooked by heating cannot be turned back into a raw egg by cooling the cooked egg, cookie dough that is baked does not return to its uncooked form when cooled, charcoal that is formed by heating wood does not return to its original form when cooled).

2-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary. Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ● Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.	**LS2.A: Interdependent Relationships in Ecosystems** ● Plants depend on water and light to grow.	**Cause and Effect** ● Events have causes that generate observable patterns.

Observable features of the student performance by the end of the grade:		
1	Identifying the phenomenon under investigation	
	a	Students identify and describe* the phenomenon and purpose of the investigation, which include answering a question about whether plants need sunlight and water to grow.
2	Identifying the evidence to address the purpose of the investigation	
	a	Students describe* the evidence to be collected, including:
		i. Plant growth with both light and water.
		ii. Plant growth without light but with water.
		iii. Plant growth without water but with light.
		iv. Plant growth without water and without light.
	b	Students describe* how the evidence will allow them to determine whether plants need light and water to grow.
3	Planning the investigation	
	a	Students collaboratively develop an investigation plan. In the investigation plan, students describe* the features to be part of the investigation, including:
		i. The plants to be used.
		ii. The source of light.

		iii.	How plants will be kept with/without light in both the light/dark test and the water/no water test.
		iv.	The amount of water plants will be given in both the light/dark test and the water/no water test.
		v.	How plant growth will be determined (e.g., observations of plant height, number and size of leaves, thickness of the stem, number of branches).
	b	Students individually describe* how this plan allows them to answer the question.	
4	Collecting the data		
	a	According to the investigation plan developed, students collaboratively collect and record data on the effects on plant growth by:	
		i.	Providing both light and water,
		ii.	Withholding light but providing water,
		iii.	Withholding water but providing light, or
		iv.	Withholding both water and light.

2-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

Science and Engineering Practices

Developing and Using Models

A practice of both science and engineering is to use and construct conceptual models that illustrate ideas and explanations. Models are used to develop questions, predictions and explanations; analyze and identify flaws in systems; build and revise scientific explanations and proposed engineered systems; and communicate ideas. Measurements and observations are used to revise and improve models and designs. Models include, but are not limited to: diagrams, drawings, physical replicas, mathematical representations, analogies, and other technological models.

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool.

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on animals for pollination or to move their seeds around.

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people.*(secondary)*

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

Observable features of the student performance by the end of the grade:		
1	Components of the model	
	a	Students develop a simple model that mimics the function of an animal in seed dispersal or pollination of plants. Students identify the relevant components of their model, including those components that mimic the natural structure of an animal that helps it disperse seeds (e.g., hair that snares seeds, squirrel cheek pouches that transport seeds) or that mimic the natural structure of an animal that helps it pollinate plants (e.g., bees have fuzzy bodies to which pollen sticks, hummingbirds have bills that transport pollen). The relevant components of the model include:
		i. Relevant structures of the animal.
		ii. Relevant structures of the plant.
		iii. Pollen or seeds from plants.
2	Relationships	
	a	In the model, students describe* relationships between components, including evidence that the developed model mimics how plant and animal structures interact to move pollen or disperse seeds.
		i. Students describe* the relationships between components that allow for movement of pollen or seeds.
		ii. Students describe* the relationships between the parts of the model they are developing and the parts of the animal they are mimicking.
3	Connections	
	a	Students use the model to describe*:

		i.How the structure of the model gives rise to its function.
		ii. Structure-function relationships in the natural world that allow some animals to disperse seeds or pollinate plants.

2-LS4-1 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

2-LS4-1. **Make observations of plants and animals to compare the diversity of life in different habitats.** [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.]

Science and Engineering Practices

Planning and Carrying Out Investigations

Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary.

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data which can be used to make comparisons.

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Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas

LS4.D: Biodiversity and Humans

- There are many different kinds of living things in any area, and they exist in different places on land and in water.

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns.

Observable features of the student performance by the end of the grade:		
1	Identifying the phenomenon under investigation	
	a	Students identify and describe* the phenomenon and purpose of the investigation, which includes comparisons of plant and animal diversity of life in different habitats.
2	Identifying the evidence to address the purpose of the investigation	
	a	Based on the given plan for the investigation, students describe* the following evidence to be collected:
		i. Descriptions* based on observations (firsthand or from media) of habitats, including land habitats (e.g., playground, garden, forest, parking lot) and water habitats (e.g., pond, stream, lake).

		ii.	Descriptions* based on observations (firsthand or from media) of different types of living things in each habitat (e.g., trees, grasses, bushes, flowering plants, lizards, squirrels, ants, fish, clams).
		iii.	Comparisons of the different types of living things that can be found in different habitats.
	b	Students describe* how these observations provide evidence for patterns of plant and animal diversity across habitats.	
3	Planning the investigation		
	a	Based on the given investigation plan, students describe* how the different plants and animals in the habitats will be observed, recorded, and organized.	
4	Collecting the data		
	a	Students collect, record, and organize data on different types of plants and animals in the habitats.	

2-ESS1-1 Earth's Place in the Universe

Students who demonstrate understanding can:

2-ESS1-1. **Use information from several sources to provide evidence that Earth events can occur quickly or slowly.** [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.]

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it, and are consistent with the available evidence.

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations from several sources to construct an evidence-based account for natural phenomena.

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.

Crosscutting Concepts

Stability and Change

- Things may change slowly or rapidly.

Observable features of the student performance by the end of the grade:		
1	Articulating the explanation of phenomena	
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that Earth events can occur very quickly or very slowly.
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.
2	Evidence	
	a	Students describe* the evidence from observations (firsthand or from media; e.g., books, videos, pictures, historical photos), including:
		i. That some Earth events occur quickly (e.g., the occurrence of flood, severe storm, volcanic eruption, earthquake, landslides, erosion of soil).
		ii. That some Earth events occur slowly.
		iii. Some results of Earth events that occur quickly.
		iv. Some results of Earth events that occur very slowly (e.g., erosion of rocks, weathering of rocks).
		v. The relative amount of time it takes for the given Earth events to occur (e.g., slowly, quickly, hours, days, years).
	b	Students make observations using at least three sources
3	Reasoning	

	a	Students use reasoning to logically connect the evidence to construct an evidence-based account. Students describe* their reasoning, including:
		i. In some cases, Earth events and the resulting changes can be directly observed; therefore, those events must occur rapidly.
		ii. In other cases, the resulting changes of Earth events can be observed only after long periods of time; therefore, these Earth events occur slowly, and change happens over a time period that is much longer than one can observe.

2-ESS2-1 Earth's Systems

Students who demonstrate understanding can:

2-ESS2-1. **Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*** [Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it, and are consistent with the available evidence.

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Compare multiple solutions to a problem.

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems

- Wind and water can change the shape of the land.

ETS1.C: Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. *(secondary)*

Crosscutting Concepts

Stability and Change

- Things may change slowly or rapidly.

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Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Developing and using technology has impacts on the natural world.

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Connections to Nature of Science

Science Addresses Questions About the Natural and Material World

- Scientists study the natural and material world.

Observable features of the student performance by the end of the grade:		
1	Using scientific knowledge to generate design solutions	
	a	Students describe* the given problem, which includes the idea that wind or water can change the shape of the land by washing away soil or sand.
	b	Students describe* at least two given solutions in terms of how they slow or prevent wind or water from changing the shape of the land.
2	Describing* specific features of the design solution, including quantification where appropriate	
	a	Students describe* the specific expected or required features for the solutions that would solve the given problem, including:
		i. Slowing or preventing wind or water from washing away soil or sand.
		ii. Addressing problems created by both slow and rapid changes in the environment (such as many mild rainstorms or a severe storm and flood).
3	Evaluating potential solutions	
	a	Students evaluate each given solution against the desired features to determine and describe* whether and how well the features are met by each solution.
	b	Using their evaluation, students compare the given solutions to each other.

2-ESS2-3 Earth's Systems

Students who demonstrate understanding can:

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information

Scientists and engineers need to be communicating clearly and articulating the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as, orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question.

Disciplinary Core Ideas

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed.

Observable features of the student performance by the end of the grade:		
1	Obtaining information	
	a	Students use books and other reliable media as sources for scientific information to answer scientific questions about:
		i. Where water is found on Earth, including in oceans, rivers, lakes, and ponds.
		ii. The idea that water can be found on Earth as liquid water or solid ice (e.g., a frozen pond, liquid pond, frozen lake).
		iii. Patterns of where water is found, and what form it is in.
2	Evaluating Information	
	a	Students identify which sources of information are likely to provide scientific information (e.g., versus opinion).

K-2-ETS1-1 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-1. **Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems A practice of science is posing and refining questions that lead to descriptions and explanations of how the natural and designed world(s) work and these questions can be scientifically tested. Engineering questions clarify problems to determine criteria for possible solutions and identify constraints to solve problems about the designed world. Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions. • Ask questions based on observations to find more information about the natural and/or designed world(s). • Define a simple problem that can be solved through the development of a new or improved object or tool.	**ETS1.A: Defining and Delimiting Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. • Asking questions, making observations, and gathering information are helpful in thinking about problems. • Before beginning to design a solution, it is important to clearly understand the problem.	

Observable features of the student performance by the end of the grade:			
1	Addressing phenomena of the natural or designed world		
	a	Students ask questions and make observations to gather information about a situation that people want to change. Students' questions, observations, and information gathering are focused on:	
		i.	A given situation that people wish to change.
		ii.	Why people want the situation to change.
		iii.	The desired outcome of changing the situation.
2	Identifying the scientific nature of the question		
	a	Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.	
3	Identifying the problem to be solved		
	a	Students use the information they have gathered, including the answers to their questions, observations they have made, and scientific information, to describe* the situation people want to change in terms of a simple problem that can be solved with the development of a new or improved object or tool.	
4	Defining the features of the solution		
	a	With guidance, students describe* the desired features of the tool or object that would solve the problem, based on scientific information, materials available, and potential related benefits to people and other living things.	

K-2-ETS1-2 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models A practice of both science and engineering is to use and construct conceptual models that illustrate ideas and explanations. Models are used to develop questions, predictions and explanations; analyze and identify flaws in systems; build and revise scientific explanations and proposed engineered systems; and communicate ideas. Measurements and observations are used to revise and improve models and designs. Models include, but are not limited to: diagrams, drawings, physical replicas, mathematical representations, analogies, and other technological models. Another practice of both science and engineering is to identify and correctly use tools to construct, obtain, and evaluate questions and problems. Utilize appropriate tools while identifying their limitations. Tools include, but are not limited to: pencil and paper, models, ruler, a protractor, a calculator, laboratory equipment, safety gear, a spreadsheet, experiment data collection software, and other technological tools. Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. • Develop a simple model based on evidence to represent a proposed object or tool.	**ETS1.B: Developing Possible Solutions** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	**Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s).

Observable features of the student performance by the end of the grade:			
1	Components of the model		
	a	Students develop a representation of an object and the problem it is intended to solve. In their representation, students include the following components:	
		i.	The object.
		ii.	The relevant shape(s) of the object.
		iii.	The function of the object.
	b	Students use sketches, drawings, or physical models to convey their representations.	
2	Relationships		
	a	Students identify relationships between the components in their representation, including:	
		i.	The shape(s) of the object and the object's function.

		ii. The object and the problem it is designed to solve.
3	Connections	
	a	Students use their representation (simple sketch, drawing, or physical model) to communicate the connections between the shape(s) of an object, and how the object could solve the problem.

K-2-ETS1-3 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists and engineers use a range of tools to identify the significant features in the data. They identify sources of error in the investigations and calculate the degree of certainty in the results. Advances in science and engineering makes analysis of proposed solutions more efficient and effective. They analyze their results by continually asking themselves questions; possible questions may be, but are not limited to: “Does this make sense?” "Could my results be duplicated?" and/or “Does the design solve the problem with the given constraints?” Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Analyze data from tests of an object or tool to determine if it works as intended.	**ETS1.C: Optimizing the Design Solution** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	

Observable features of the student performance by the end of the grade:		
1	Organizing data	
	a	With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
2	Identifying relationships	
	a	Students use their organization of the data to find patterns in the data, including:
		i. How each of the objects performed, relative to:
		1. The other object.
		2. The intended performance.
		ii. How various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength).
3	Interpreting data	
	a	Students use the patterns they found in object performance to describe*:
		i. The way (e.g., physical process, qualities of the solution) each object will solve the problem.
		ii. The strengths and weaknesses of each design.
		iii. Which object is better suited to the desired function, if both solve the problem?